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ABSTRACT

This comparative case study investigated instructional methods that effectively enhance the development of students' critical thinking. Four institutions were selected for study; two at which students reported experiencing high degrees of growth in the ability to think critically, and two at which students reported experiencing low degrees of growth. Analysis of the data, which came primarily from 55 interviews and 28 classroom observations, suggests that the development of critical thinking is linked to an emphasis on writing and rewriting. At the two schools scoring high on an institutional growth in critical thinking (IGCT) measure, there was a strong focus on writing, a focus absent from the two schools that scored low on IGCT. At one school (high IGCT, low selectivity) a curricular policy stipulates that writing be an integral part of all course programs (which are taught by a multi-disciplinary team of faculty members). Another classroom factor that appears related to the development of critical thinking is an emphasis on class discussion, which again exists at the two high IGCT institutions. Appendices include a table showing selection criterion for case study sites, a summary of classroom observation data, and descriptions of categories for the observation data. (Contains 38 references.) (RH)

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Critical Thinking Inside College Classrooms:

Evidence from Four Institutional Case Studies

Lisa Tsui

Paper presented at the annual meeting of the

Association for the Study of Higher Education

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Abstract

This article presents the findings from a study that investigates instructional methods that effectively enhance the development of students' critical thinking. The institutions in this sample were selected such that they included two institutions where students reported experiencing a high degree of growth in the ability to think critically, and two institutions where students reported experiencing a low degree of growth in the ability to think critically. A comparative analysis of the data, which came primarily from fifty-five interviews and twenty-eight classroom observations, reveal some consistent findings regarding how writing assignments and class discussion can be made conducive to critical thinking development.

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This paper was presented at the annual meeting of the Association for the Study of Higher Education held in San Antonio, Texas, November 18-21, 1999. This paper was reviewed by ASHE and was judged to be of high quality and of interest to others concerned with higher education. It has therefore been selected to be included in the ERIC collection of ASHE conference papers.

Critical Thinking Inside College Classrooms:

Evidence from Four Institutional Case Studies

While Americans today are more highly educated than ever before, they are not necessarily better educated. In this country formal education largely entails knowledge building through subject matter content coverage. Unfortunately, this often comes at the neglect of skills building. Rather than devoting so much effort to teaching students *what* to think, we need to do more to teach them *how* to think. Higher-order cognitive skills, such as the ability to think critically, are invaluable to students' futures for it prepares them to tackle a multitude of challenges that they are ultimately likely to face in their personal lives, careers, and duties as responsible citizens. Moreover, by instilling critical thinking in students we groom individuals to become independent lifelong learners—thus fulfilling one of the long-term objectives of the educational enterprise.

A preponderance of evidence from the research literature on critical thinking suggests that significant gains in critical thinking are both perceived (Astin, 1993; Pace, 1974; Terenzini, Theophilides, & Lorang, 1984; Tsui, 1999) and experienced by college students (Dressel & Mayhew, 1954; Keeley, 1992; Keeley, Browne, Kreutzer, 1982; King, Wood, & Mines, 1990; Klassen, 1983; Lehnmann, 1963; Mines, King, Hood, & Wood, 1990; Pascarella, 1989; Spaulding & Kleiner, 1992). Yet, many consider the level of critical thinking displayed by students to be inadequate. Norris (1985) noted that competence in critical thinking is lower than it should be at every stage of schooling. In a study by Keeley, Browne, and Kruetzer (1982), seniors outperformed freshmen in analyzing articles through an essay response format. Yet, the absolute level of

performance displayed by seniors revealed "major deficiencies" in critical thinking skills. For instance, 40-60% of the participating seniors could not provide a single example of a logical flaw, significant ambiguity, or misuse of data, when asked to assess a written passage containing several such errors. Using the same data source, Keeley (1992) analyzed responses by freshmen and senior students on a task to identify assumptions and found "poor performance" exhibited by both groups. In a study involving 874 college sociology students, Logan (1976) concluded that students at all levels (from freshmen to graduate students) scored "very low" in critical thinking as measured by a test to assess students' abilities to recognize uncritical or unsound thinking.

Research can and should assist faculty in their efforts to nurture critical thinking in students. As yet, however, little substantiated knowledge on effective teaching techniques emerges from the research on critical thinking. The majority of studies conducted on college students' abilities to think critically include no examination of instructional factors (Tsui, 1998b). Limited efforts to study the effects of specific teaching techniques may stem from the difficulty of attaining direct indicators for instructional approach. In conducting a review of research in this area, I was able to locate only one published study on critical thinking that involved actual classroom observation data on instruction. Studies that address classroom experiences tend to rely on self-reported data rather than observational data. Moreover, those studies that investigate the impact of instruction often do not focus on the same aspects of teaching. Among those that do focus on the same instructional elements, some have reached contradictory findings. Consequently, little consistency emerges from the empirical

research literature as to specific instructional techniques that effectively enhance students' abilities to think critically (McMillan, 1987; Tsui, 1998b).

In a 1995 study by Terenzini, Springer, Pascarella, and Nora, critical thinking, as measured by scores on the critical thinking module of the Collegiate Assessment of Academic Proficiency (CAAP), was found significantly and positively related to only a few classroom and instructional experiences. Found not significantly related to the outcome variable were number of textbooks or assigned books read, number of essay exams taken, number of term papers or other written reports, student relationship with faculty, student perceived instructor effectiveness in mathematics, and student perceived instructor effectiveness in arts and humanities. Found significantly related to the outcome variable were hours per week spent studying, frequency and nature of use of library, and student perceived instructor teaching effectiveness in social science. Once students' precollege level of critical thinking was controlled for, however, only hours per week spent studying remained statistically significant.

Smith (1977, 1981) found three kinds of instructor-influenced classroom interactions to be consistently and positively related to gains in critical thinking (as measured by the Watson-Glaser Critical Thinking Appraisal and the Chickering behavioral self-report index): the extent to which faculty members encouraged, praised, or used student ideas; the amount and cognitive level of student participation in class; and, the amount of interaction among students in a course. In a study by Terenzini, Theophilides, and Lorang (1984), students' level of classroom involvement was found to exert a significant and positive effect on an outcome variable representing an academic skills measure that included aspects of critical thinking. Unfortunately, in reporting the

results of this study the nature of the classroom involvement composite variable was not clearly specified. Analyses of data drawn from a national sample of college students by Astin (1993) and Tsui (1999) revealed that self-assessed growth in critical thinking is positively related to such instructional factors as having a paper critiqued by an instructor, conducting independent research, working on a group project, giving a class presentation, and taking essay exams; negatively related to this outcome is taking multiple-choice exams. In a recent study on campus culture and critical thinking, successful development of students' critical thinking skills was linked to an emphasis on cooperative exploration of knowledge and divergent thinking (Tsui, in press).

On the whole research studies on critical thinking have not displayed great variety in research design. There appears to be an overwhelming reliance on quantitative data of a certain sort. More specifically, researchers have tended to use standardized multiple-choice tests to measure critical thinking, and students' responses on questionnaire surveys to measure classroom and out-of-class experiences. Yet, any single research method is necessarily limited in its capability, and endowed with its own particular weaknesses. Hence, knowledge derived by research largely depends upon accumulated contested and confirmed findings culled from skillfully conducted studies that are diverse in methodology. This study contributes to research on critical thinking by expanding the type of approach taken to investigate this subject. In this study comparative institutional case studies were conducted wherein multiple sources of data were tapped. This produced rich and detailed contextual data about the process whereby certain pedagogical factors can affect the development of students' critical thinking.

RESEARCH METHODS

Data Collection

In this study the relationship between pedagogy and critical thinking development is treated as one that is not divorced from its environs, but rather intricately linked and dependent upon it. The decision to conduct institutional case studies was based in part upon the belief that in order to attain a fuller understanding of the complex phenomenon by which pedagogy affects students' cognitive development, the contextual elements of an educational setting need to be examined in depth. A comparative analysis of how four distinct institutions effectively or ineffectively foster critical thinking in its student body helps us to interpret the influence of particular constellations of factors within a given setting, and provides us with some sense of how common elements may operate across institutions. This study's mixed-methods approach yielded a wealth of quantitative and qualitative data. Study conclusions were strengthened as the utilization of multiple research methods eluded limitations that are commonly associated with the use of a single research method.

Data collection for this study took place via site visits to four purposefully chosen case study institutions between October 1996 and May 1997. Among the array of research methods used, the bulk of the data was gathered through classroom observations and interviews. A minimum of one administrator, five professors, and five students were interviewed at each institution. Prospective interviewees were randomly contacted from phone and email listings. Attempts were made to solicit voluntary interviewees from among individuals who participated in the classroom observations. In sum fifty-five individual interviews took place at the four sites. The interviews, which on averaged

lasted an hour, were each audio-taped and transcribed verbatim. These semi-structured interviews entailed predominantly open-ended questions. Because of the potential vagueness and varied interpretations that may surround the use of the term "critical thinking," this study's operational definition of this concept was clearly conveyed at the beginning of each interview. Interviewees were informed that for the purposes of this study, "critical thinking" refers to "students abilities' to identify issues and assumptions, recognize important relationships, make correct inferences, evaluate evidence or authority, and deduce conclusions." This definition comes from a review that examines the manner in which researchers typically operationalize critical thinking (Furedy & Furedy, 1985).

At the four case study institutions a total of twenty-eight classes were observed on a one-time basis. To compare and contrast a variety of classes, a roughly equal number of courses were sampled from the physical sciences, social sciences, and humanities. Quantitative data retrieved included the number of questions posed in class, questions asked by students, questions that elicited multiple responses, students who participated in the class discussion, challenging statements made by students, comments volunteered by students, and compliments by a professor for a student's contribution to the discussion. Descriptions of these categories appear in Appendix A. Data on each class were recorded during a fifty-minute observation period. Additional time was expended on gathering qualitative observation data by taking notes on such things as the physical characteristics of the classroom (e.g., its location, the décor of the room, and the seating layout).

A number of other data collection methods were also employed. Two focus group interviews were conducted. One occurred at School B at the conclusion of a class that I

was observing, and the second at School D during break time of a seminar course that I was observing in a professor's home. Most of the questions posed in these groups interviews were drawn from the interview guide used in the individual interviews, and augmented by questions that might have arose from the preceding observations. In addition, relevant documents and artifacts were gathered and analyzed at each of the sites. Such materials included books, almanacs, admission catalogs, website information, issues of the student published newspaper, class handouts, and reports generated by a school's institutional research office. Finally, informal conversation interviews were conducted when an appropriate opportunity arose. Such occasions allowed me to make contact with additional participants who could provide further information on a relevant issue of interest. These meeting spontaneously occurred under a diversity of circumstances. Instances include engaging students in casual conversation while waiting for an interviewee to arrive, waiting for class to convene, looking up information on a bulletin board of schedule courses, walking out of a class in which observations were conducted, and speaking individually with a campus tour guide.

Case Study Sites

The primary criterion whereby the four case study sites were chosen is linked to an analysis of some national data pertaining to critical thinking. In a related study that analyzed data gathered from over three hundred higher education institutions through the Cooperative Institutional Research Program (CIRP), a positive correlation of .56 was found between an institution's selectivity and its score on a measure that reflects the average self-perceived changed in critical thinking reported by students at that institution

(also referred to as institutional growth in critical thinking or IGCT) (Tsui, 1998a). This substantial correlation reveals that greater gains in critical thinking are more likely to be reported by students attending selective institutions than by those attending less selective institutions. This is consistent with past studies that show students at selective institutions, and in particular those at selective liberal arts colleges, are more likely to both perceive and experience greater growth in complex cognitive skills (Braxton & Nordvall, 1985; Pace, 1974, 1984, 1990; Winter, McClelland, & Stewart, 1981). In an attempt to study factors that are related to the development of critical thinking skills but which are not contingent upon an institution's selectivity, I deliberately sought to separate institutional selectivity and IGCT in the case study site selection process. Hence, these two dimensions juxtapose one another in Figure 1. An institution falling into each of the four quadrants was chosen for inclusion in the sample. As the matrix scheme suggests, case study sites were composed of two institutions with a high institutional mean in student self-assessed growth in critical thinking (one of which is high and the other low on institutional selectivity), and two institutions with a low institutional mean in student self-assessed growth in critical thinking (one of which is high and the other low on institutional selectivity).

Insert Figure About Here

Because institutional size might be a determinant of institutional effectiveness in fostering critical thinking in students, case study sites were chosen such that their student body size are comparable with one another. The student body population of each of the chosen institutions is less than 5,000. The average SAT score of students at the low selectivity institutions (School A and B) is about 1000, while that at the high selectivity institutions (Schools C and D) exceeds 1300.

Data Analysis

Strategies for analysis of the data included repeated review of all interview transcripts and observational notes. In the course of analyzing this raw data, patterns and regularities were identified, and in turn, appropriate categories were devised. The clustering of such categories generated themes from which conclusions were drawn. Analysis of the data was aided by such analytical tools as an "unordered meta-matrix,"—a large chart exhibiting emerging categories along with supporting empirical data such as snippets of relevant narratives, quotes, and key phrases (Creswell, 1994). This visual tool of summary proved especially helpful in the cross-case analyses.

To attain accuracy of findings a number of verification procedures were applied. Triangulating data from various sources of information and methods of data collection allowed for the solidification of findings. Data that conflicted with emerging patterns were vigilantly searched for, documented, and analyzed. In addition, "member checking" was utilized within interviews, and with key informants to confirm the validity of recorded data and tentative interpretations. To stimulate critical self-reflection in this type of interpretative research, documentation of procedures, methods, hunches, and analysis

were recorded via field log, field journal, interview elaboration, and memos to myself. Because of my knowledge of the IGCT status of each of the four institutions prior to data collection, I recorded my expectations, assumptions, and prejudices at the beginning of the study for subsequent analysis.

FINDINGS

Writing

Substantial evidence derived from the case studies suggests that the development of critical thinking is linked to an emphasis on writing and rewriting. At both schools that scored high on IGCT (A and D) there is a strong focus on writing that is conspicuously absent from the two schools that scored low on IGCT (B and C). When asked about possible academic factors that might be influencing the development of critical thinking skills, several of the interviewees at School A (low selectivity, high IGCT) spoke about the hefty amount of writing that is assigned to students. Given the bloated size of classes at many higher education institutions, multiple-choice examinations have become commonplace. Yet, at School A writing assignments are prevalent and multiple-choice examinations are rare. This is due in part to a curricular policy that stipulates the teaching of writing be an integral part of all course programs (which are each taught by a multidisciplinary team of faculty members). A dean and professor at School A reported:

> So much of the writing we do here is expository where critical reasoning and analysis are important. And we emphasize that when we read their

> papers and ask them what they have done. I just think it is built into the heart of our curriculum.

Not only is writing stressed, but so too is revising writing. Most course programs have a writing workshop component, which entails students reviewing and providing feedback on one another's draft papers. The exercise of assessing the work of others appears to lend itself to the use of critical thinking skills as students attempt to comprehend and critique material. Moreover, the rewriting process stimulates students to think more deeply about their own written product, and to utilize peer feedback to improve upon it. At School A another instance of how the emphasis on writing enhances students' critical thinking is found in the customary last assignment of a course program—a written self-evaluation in which students are prompted to reflect critically upon their performance and growth.

Similar to School A, an emphasis on writing is formally grounded in the curriculum at School D. Students at School D (high selectivity, high IGCT) are required to take two courses each in the natural sciences, social sciences, and humanities that emphasize writing and that are in conjunction with the Writing Tutor Program on campus. In these courses a student writes a paper, meets with a student tutor to discuss changes, reworks the paper, and then submits both the original and revised paper to their professor. It is likely that this "two-step process"—which allows one to work on writing within the context of a particular discipline, and to utilize criticism in refining one's own work—fosters a greater degree of critical thinking than the traditional single step writing assignment. When asked about what classroom factors influence the development of

critical thinking, several School A student spoke about the emphasis on writing. One School A student explained, "One of the things I started doing here is when I read things...I take actual written notes. Because writing is so much programmed in the experience here that it becomes a means of forcing yourself to think about something more critically than you would otherwise do just reading it."

The strong orientation on writing found at the two high IGCT institutions does not simply entail plentiful writing and rewriting, but also a focus on the synthesis, analysis, and refinement of ideas through the medium of writing. Because of a premium placed on critical analysis, writing assignments typically ask students to demonstrate more than a mere understanding of someone's work. One School D professor offered an example to illustrate how the rewriting process allows students to integrate ideas and improve upon their own thinking and writing:

> A senior came and wrote a paper for me....I decided it was crap. He was outraged because he thought he was a very bright student. I told him why: I thought it was superficial and not well argued. And I think it must have triggered something because he did about 6 or 7 versions of it and finally he got the award for the best paper in the department for seniors that year. And my colleagues all agreed that he produced a first-rate work that had these critical thinking skills in it. There are other instances like that where I see students working on their theses since the fall. In seminars students write their papers and get feedback. In economics, they tell them to rewrite papers for a journal review. I think there is a conscious effort to figure out

> ways that we can incrementally test and change, and update a more complicated set of offerings in the cafeteria of knowledge. And, provide opportunities for them to make integrations and to deal with that.

In contrast, writing is not emphasized at the two low IGCT schools. Unlike the two high IGCT schools, neither Schools B nor C has any curricular policy pertaining to writing requirements. At the two low IGCT institutions classroom observations did not uncover any instances in which class time was devoted to peer exchange and feedback on writing, unlike in the cases of the two high IGCT institutions. At School B (low selectivity, low IGCT) student performance is commonly assessed by multiple-choice examinations rather than writing assignments. Only one School B student mentioned writing when asked about classroom factors that influence students' critical thinking skills.

At School C (high selectivity, low IGCT), where the curriculum revolves around math and science, homework and examinations tend to entail work problems rather than writing assignments. Recognizing this fact about his institution, a non science faculty member at School C reported feeling an added need to work with students on writing. He explained that while students at School C are very bright and capable, he finds their writing skills to be far weaker than those of students at less selective institutions where he has taught. The faculty members I interviewed at School C generally reported doing little to incorporate writing into their courses. One professor explained that the short duration of a single term makes it "practically impossible" to assign research papers. Another professor reported that when he first started teaching he would assign writing

assignments or research papers, but stopped doing so because students seemed rushed and did not appear to spend enough time on such assignments:

> ...they are probably not getting enough writing assignments. But it just didn't seem worth it. And I sort of didn't want to correct grammar. I do that for my graduate students because it is part of that professional training, and it reflects on me. With the undergraduates it does not reflect on me, but only indirectly.

This professor explained that he opts to foster reasoning skills in students by assigning "complicated" work problems rather than writing assignments. School C highlights the fact that some may not undertake the development of critical thinking through an emphasis on writing because it demands additional time and effort. As Schools A and D illustrate, this commonly entails reserving time to devise constructive assignments; to construct in class opportunities for students to share drafts of their work and receive peer input; and, to read, evaluate, and provide feedback on papers. Moreover, the case of Schools C shows that a curricular emphasis on writing comes about more readily in certain disciplines (e.g., humanities and social sciences) than in others (e.g., math, science, and engineering). Yet, this is not an immutable impediment as demonstrated by Schools A and D for these two high IGCT institutions have managed to successfully stress writing across the entire curriculum. While the science faculty members at the high IGCT institutions do give out work problems, they also tend to assign term papers and tests that require a short essay response format.

Comparative analysis of the case study data strongly suggests that an emphasis on writing and rewriting exists at the institutions that scored high on IGCT (Schools A and D) but not at the institutions that scored low on IGCT (Schools B and C). Schools A and D demonstrate that the promotion of a certain type of writing assignment across the curriculum (namely, that which calls for more analysis and less description) can contribute greatly to the effective cultivation of students' critical thinking skills. Moreover, the additional assignment of rewriting and effective utilization of feedback seems to beckon students to think critically about incorporating constructive criticism in fine-tuning their intellectual products.

Classroom Discussion

Another classroom factor that appears to be related to the development of critical thinking skills is an emphasis on class discussion, which exists at the two high IGCT institutions but not at the two low IGCT institutions. At School A class discussion is a fundamental feature of the seminar component of each course program. This active learning approach seems to foster critical thinking by encouraging students to verbalize and try out ideas. One student spoke about how an emphasis on class discussion at School A affords her opportunities that she did not feel were available to her at her previous institution:

> Well all I can do is compare it to community college where sometimes I would be in lecture and I really wanted to say something and I couldn't because it was a lecture. And I would want to ask a question, make a

> comment, or make a correlation and I wouldn't because I would feel like it was not appropriate. And here I feel that it is. And so the development of ideas is really encouraged.

Class discussions are much embraced by students at School A, as explained by the following student:

> ...students prefer seminars where they talk with each other and are allowed to form their own opinions as opposed to being lectured to and opinions are forced down their throat. There is definitely this matter of trying to develop yourself...a very individual bent. This school really emphasizes community and the importance of individual opinions simultaneously.

Likewise at School D much evidence emerged to support a relationship between class discussion and the development of critical thinking skills, as some interviewees cited the former as a "crucial factor" to the latter. A student at School D explained why he feels class discussion is related to critical thinking:

> The difference of being here and educating yourself is the exchange with other people...On the one hand you feed off of other people's observations and they can complement and enrich your own. But it is also the need to drive other people's thinking that way. To reciprocate this kind

> of exchange forces you to be more critical and analytical in terms of whatever you are doing. And that is facilitated when you read other people's papers as opposed to it being just between professor and student.

Another School D student explained that she has come to value critical thinking more since entering college because of ample opportunity to discuss and disagree with her peers. She recalled that in high school she was not exposed to a lot of class discussion, and thus when people said things she disagreed with she felt, "it was not important to me or the class why I didn't agree or why it was wrong." Her interaction with peers has changed since entering college: "I find myself more engaged with the thoughts of my peers...giving more validity to what my peers say....And, to really think about why I don't agree with what they say...and to push myself beyond yeah or no." Another School D student offered an explanation as to why discussion-based courses are more effective than lecture-based courses in promoting critical thinking. He reasoned that with the former "you have to focus the whole time and really pay attention...even while you are writing notes you have to be thinking of questions and making sure you know what is going on," while with the latter "you don't have to be able to talk about it right then...you can be sort of asleep and just write down what she is saying...you don't have to really process it in a way." According to another School D student, "class discussion greatly encourages critical thinking" because when students are "urged to speak their minds, they have to put their thoughts through a process of clarification," whereupon it is scrutinized by others. One School D professor drew a similar connection:

> I think when you have to discuss something in detail...that really stimulates one's ability to think about something critically and analyze it critically because if you don't you are not going to look very intelligent to your peers, especially if your peers have reached a certain level of synthetic thinking.

Such emphases on class discussion are in contrast to what is found at Schools B and C, the two low IGCT institutions. Though the courses that I observed at School B were generally small, the most common mode of instruction witnessed was lecture, with the majority of class time taken up by a professor's efforts to impart information to students. Interview data confirmed that most courses at School B are lecture-based. Students are not engaged in class discussions more frequently, explained a School B student, because the interruption of a lecture by student input is not always seen as helpful:

> Well you have to get through the material. You need to know the stuff that is taught on the syllabus. And those kinds of interjections, while they can be beneficial to the rest of the class, sometimes aren't. And a lot of times they confuse the direction of the course or the lesson of the day.

Another School B student reported that while some professors are behind schedule and thus "just want to lecture and get out," there are other professors who seek discussion but

are not so successful because some students are simply unwilling to participate. A School B professor offered an explanation as to why this may be the case:

> Students are afraid of give and take because they don't have much to give, because again, most of them are poorly read....So they are not too terribly challenging generally....Maybe the problem is they are afraid of making themselves look foolish in front of their peers.

Similar to School B, the most common approach to conducting class at School C, as revealed by participant interviews and classroom observations, is the lecture format. As at most institutions, science courses, especially the lower level ones, in comparison to non-science courses, tend to be larger and entail more lecturing than discussion. For example, one School C professor estimated that he devotes about three-fourths of class time to lecture and noted that "there is a fine line between interactive monologue and lecture." According to one student, professors at School C "tend to ask two or three questions per lecture or they won't ask any questions at all and wait for students to ask." According to another professor, students at School C represent "a very strange group" because while they are "incredibly smart...they do not think it is their role in life to get involved much in class discussions."

At School C the strong emphasis on lecturing appears to be driven by instructors' desires to optimize course material coverage. Several professors explained that class time is usually devoted to presenting material not covered in the assigned reading or homework. Most of the faculty members I spoke with seem to feel pressed for time to

address all that they want to cover in a course. Students are complicit in devoting time to lecture-supported material coverage rather than class discussion. The sentiment "if you spend too much time asking people questions then you can't get through the material," expressed by one School C student appears to be widely shared by her peers. One School C professor described his classes as more interactive than those of his colleagues because he occasionally runs around class "like Donahue," posing questions to students from time to time just so students "can be actively engaged" and thus be "less likely to fall asleep." He warned, however, "you can't get too much into their face because they expect to take something away from class."

Many School C students seem to hold back on speaking up in class for fear of disrupting the class. The majority of the students I interviewed prefer to ask questions of their professors after class rather than during class. One student explained that it is "more convenient" to do so since most questions asked in class are for "clarification" and he does not like to interrupt "the flow of lecture." Responding to my inquiry regarding classroom involvement, this student's comment typified those offered by her peers:

> But then in something like math, there is really not much to be said since the professor lectures. So unless you have a question. And, if I do I usually mark it in my notes as opposed to asking. Unless you have a really relevant question that you think a lot of people share you will be wasting time and people will get really irritated with you if you keep like stopping him and he can't get through all the notes that day and it's just a mess. I

> ask directly after class...this is pretty much the standard way. After class there are usually 8 or 9 people up in the front to clarify whatever was said.

Another student explained that he does not more frequently engage in class discussions because sometimes he feels it is not "safe" to do so. He reported that like many of his peers he is more "comfortable" consulting the teaching assistant than the professor because the former "can't change a test score or give a bad recommendation." Another student stated that in some classes she felt "intimidated because the professors often assumed the students were as brilliant as they are."

Despite limited opportunities for class participation, students at School C generally appear satisfied with the manner in which courses are conducted. The lecture format may be the preferred approach for many students because not only does it allow the instructor to address more material, but it requires less psychic energy from students—many of whom have stayed up all night or have received only a few hours of sleep. School C students would more frequently raise questions and challenge mistakes made in class, according to one professor, if they were not so "overworked" and "burdened by the course load."

The classroom observation data, summarized in the table below, on the whole support a higher incidence of classroom discussion at the two high IGCT schools (A and D) in comparison to the two low IGCT schools (B and C). The average class size at each institution is approximately 20 students or less. The average number of questions posed per class tends to be higher at the high IGCT institutions (15 and 15.7 at Schools A and D, respectively) than at the low IGCT institutions (13.7 and 7.6 at Schools B and C,

respectively). In terms of proportion of questions that were posed by students (as opposed to the instructor), no trend was detected between the high and the low IGCT schools. The high and low IGCT institutions also did not consistently differ on the percentage of questions posed in discussion that elicited multiple responses. There was, however, quite a spread in the results for this category with a high of 30% for School D (high selectivity, high IGCT), and a low of 0% for School C (high selectivity, low IGCT).

Insert Table about here

The classroom observation data indicate that students at the high IGCT schools, in comparison to those at the low IGCT schools, were much more likely to respond to questions posed by their classmates. The percent of questions posed by a student that were met by some kind of a response from a fellow student were 60% and 34% for the two high IGCT schools, and only 3% and 0% for the two low IGCT schools. Observations revealed a greater percentage of students participated in class discussions at the high IGCT schools (64% and 59%) in comparison to the low IGCT schools (33% and 29%). Students at the high IGCT institutions, in comparison to the low IGCT institutions, tended to make a greater number of challenging statements in class (averages of 4.3 and 1.4 in comparison to 0.1 and 0.5). Students at the high IGCT institutions also volunteered a greater number of comments in class than did students at the low IGCT institutions (averages of 2.3 and 0.8 in comparison to 0 and 0.5). Moreover, professors at the high

IGCT schools, in comparison to those at the low IGCT schools, are more likely to compliment students for what they said in class (averages of 6.3 and 4.7 in comparison to 1.1 and 0).

Participation in classroom discussions can foster critical thinking skills by allowing students to test out their ideas verbally, to reflect upon the views of one's peers, and to critically modify one's own views through incorporating feedback from others. This relationship appears to be recognized by those who teach at Schools A and D (the high IGCT institutions) as many of the professors there deliberately seek to elicit a high degree of class discussion in the courses they teach. In contrast, those teaching at Schools B and C (the low IGCT institutions) do relatively little to promote class discussion. Comparative analysis of the case studies also shows that seminar courses can play a vital role in the development of students' critical thinking skills. Seminar courses are more prevalent at the high IGCT institutions in comparison to the low IGCT institutions. Because seminar courses tend to have smaller class sizes and to pursue focused concentration of subject matter, it lends itself to the employment of class discussion and writing assignments.

DISCUSSION

While pursuit of innovative pedagogy that enhances students' critical thinking skills can certainly be beneficial, there is a great need to investigate how standard teaching methods can be modified and made efficacious toward this end. This is important because as some observers have pointed out, more faculty are not actively engaged in fostering critical thinking in students because many view it as being time-

consuming and risky (Haas & Keeley, 1998). Hence, widespread efforts to heighten students' critical thinking through instructional change is more likely to come about if it involves alteration of commonplace teaching techniques rather than radical replacement of current pedagogic tools. Because most college courses involve writing and discussion in varying degrees, it is especially worthwhile to study how such prevalent course elements can be effectively utilized to enhance students' critical thinking skills.

Unlike previous research efforts that merely examine if critical thinking is statistically and significantly related to certain instructional factors, this study investigated the contextual conditions surrounding such relationships. In the case of writing, both the amount of writing and the nature of the writing assignment matter. Writing that is conducive to critical thinking is that which demands more analysis and less description. Furthermore, feedback on one's writing can facilitate further critical thinking, especially if it involves rewriting an assignment. This is because rewriting behooves students to take an added step towards the practice of critical thinking skills by utilizing feedback to refine one's work. As the case studies suggest, writing is likely to exert a greater impact on student cognitive outcomes when it is stressed throughout the curriculum. An institution's success in fostering critical thinking is in part contingent upon the degree to which faculty members from across disciplines utilize writing assignments in their teaching.

Findings here also suggest that class discussion can enhance critical thinking. But to do so it requires faculty to rely less on passive learning methods such as lecturing, which is the most commonly employed method of instruction in undergraduate education. It is estimated that teachers in the typical classroom spend about 80 percent of their time

lecturing to students (Fischer & Grant, 1983; Smith, 1983), who in turn are attentive to what is being said about 50 percent of the time (Pollio, 1984).

In order to optimize learning a critical balance must be struck between subject matter breadth and depth. While discussion is likely to detract away from breadth of subject matter coverage, it is conducive to extending its depth. Students are more likely to comprehend and to retain ideas when they participate in a dialogue or debate on them. This is supported by empirical evidence which suggests that information that is actively processed rather than merely "recorded," is more readily retrieved from memory, more accessible for application to new situations, and less likely to be forgotten (Bransford, 1979; Craik, 1979). In a review of the relevant research, Pascarella and Terenzini (1991) found that when the goal of instruction is higher-order cognitive skills (e.g., critical thinking, problem solving), classroom discussion is somewhat more effective than lecturing. Effective class discussion, however, requires considerable effort from both teacher and students. To propagate useful discussion, instructors need to skillfully guide discussion and to facilitate student participation. This means knowing when to interject and when not to, how to pose thought-provoking questions, and what to do when students too readily reach consensus. Moreover, in order for effective class discussion to come about students will need to feel that they are not being disruptive of class, but rather contributory to it.

Study Implications and Recommendations

This study yields a number of implications and recommendations for practice. With regard to writing, professors need to include in their courses a greater number of

writing assignments that require students to demonstrate synthesis of material, evaluation of arguments, deduction of conclusions, and so on. Furthermore, professors can stimulate students to exercise critical thinking skills by incorporating a rewriting component in the design of their courses. Promotion of critical thinking through rewriting can be boosted by opportunities for students to receive constructive feedback—whether it comes from the instructor, teaching assistant, writing tutor, or classmates. Institutions can do their part by formally grounding writing in the curriculum. This can be accomplished by requiring students to take from various disciplines specially designed courses that emphasize analytical writing. By iterating analytical writing across disciplinary boundaries students will experience opportunities to apply critical thinking to diverse subject matter and throughout each of their college years.

In trying to foster critical thinking through class discussion, professors first need to seek ways to raise students' confidence in their ability to contribute to class. Tactics employed by some faculty members in this study included arranging class seating in a circular or semi-circular pattern, calling on students to answer questions, grading on student participation, emailing students questions for discussion prior to a class meeting, requesting students address their comments to the entire class rather than to the instructor solely, holding class in a more informal setting such as a professor's home, and utilizing small group work or student class presentations. Finding that peers can exert a substantial influence on students' confidence, and that positive emotional climates occur when students are cooperative and supportive and make friends in class, Fessinger (1995) recommends that instructors might consider developing more assignments using study groups or learning partners. In a study by Nunn (1996), class participation was found

significantly related to certain teaching techniques: praising students, asking questions, probing for elaboration of student contributions, accepting answers, repeating answers, using student names, and correcting wrong answers.

Results from the classroom observation portion of this study suggest that critical thinking development through classroom discussion can be facilitated by a number of actions: having both professors and students ask more questions in class; encouraging students to respond to questions posed by their peers; seeking not only a greater degree of discussion per se, but participation by a greater proportion of students; motivating students to question or challenge what is being said; complimenting students on their contributions to the discussion; and, encouraging students to volunteer comments rather than participating in discussion only when they are called upon or have a question.

Professors need to guard vigilantly against class discussions where the dominance of a majority perspective silences the expression of minority viewpoints. In a series of studies of undergraduate life undertaken by Levine and Cureton (1998), findings revealed that 54 percent of students feel uncomfortable expressing unpopular or controversial opinions. Instructors need to do more to bring about a class atmosphere where students are comfortable voicing a diversity of viewpoints and where they feel safe to question, critique, and disagree. Those who teach need to try out various strategies to figure out what combination of tactics will elicit the most fruitful class discussions. What is effective in one class may not work as well in the next class as it is likely to vary depending on subject matter and the peculiarities of a certain student composition. Thus, professors need to be willing to experiment and to be flexible in their approach. The intimacy of seminar courses and its more intense focus on limited subject matter seems to

make it amenable to student debate and scrutiny of ideas. Rather than reserving seminar courses for seniors or honors students, it ought to be made accessible to the entire student body early on in a student's college career. This is crucial for as the Boyer Commission (1999) points out, "the first years of university studies, in many ways the most formative of all years, are usually the least satisfactory in terms of concept, curriculum, and pedagogy" (p.19). A freshmen seminar requirement can set a precedent for high intellectual engagement from students by enabling a professor "to imbue new students with a sense of the excitement of discovery and the opportunities for intellectual growth" (p.20).

Lastly, if institutions are truly committed to achieving the widely professed educational objective of instilling critical thinking skills in students, then they need to actively support and guide faculty in teaching reform efforts. Seminars, workshops, and training sessions should not be a one-time event but rather a regular component of an institution's ongoing professional development program for faculty. The refinement of pedagogical technique should be expected from all those who teach. Furthermore, avenues for collegial exchange on teaching need to be sought out and instituted. Faculty members are likely to benefit from sharing teaching successes and frustrations with colleagues who are dealing with similar challenges. These efforts will not only promote faculty collaboration and the generation of ideas on teaching, but will yield a more united front against student resistance. In their study Everett and Zinser (1998) found that while an active learning approach led to greater critical thinking, some students resented corrective feedback on their papers and the lack of traditional lectures. Students who are used to encountering passive instructional methods that require little cognitive energy

from them may resist active instructional methods that require substantial cognitive energy. Student resistance may result in less favorable teaching evaluations and withdrawal from courses. The impact of these actions is diminished, however, when there is a collective commitment from the faculty to refashion and strengthen instruction for more effective cognitive development.

References

Astin, A. (1993). *What Matters in College?* San Francisco: Jossey-Bass.

Bransford, J. D. (1979). *Human cognition: Learning, understanding, and remembering*. Belmont, CA: Wadsworth.

Braxton, J., & Nordvall, R. (1985). Selective liberal arts colleges: Higher quality as well as higher prestige? *Journal of Higher Education, 56*, 538-554.

Craik, F. I. M. (1979). Human memory. *Annual Review of Psychology, 30*, 63-102.

Creswell, J. W. (1994). *Research design: Qualitative & quantitative approaches*. Thousand Oakes, CA: Sage Publications, Inc.

Dressel, P., & Mayhew, L. (1954). *General education: Explorations in evaluation*. Westport, CT: Greenwood Press.

Everett, M. D. & Zinser, O. (1998). Interdisciplinary social science courses: Using a critical thinking approach. *Journal of General Education, 47*, 225-241.

Fassinger, P. A. (1995). Understanding classroom interaction. *Journal of Higher Education, 66*, 82-96.

Fischer, C. G. & Grant, G. E. (1983). Intellectual levels in college classrooms. In C. L. Ellner & C. P. Barnes (Eds.), *Studies of college teaching* (pp. 47-60). Lexington, MA: D.C. Heath.

Furedy, C., & Furedy, J. (1985). Critical thinking: Toward research and dialogue. In J. Donald & A. Sullivan (eds.), *Using Research to Improve Teaching*, New Directions for Teaching and Learning, No. 23, pp. 51-69. San Francisco: JosseyBass.

Haas, P. F. & Keeley, S. M. (1998). Coping with faculty resistance to teaching critical thinking. *College Teaching, 46,* 63-67.

Keeley, S. M. (1992). Are college students learning the critical thinking skill of finding assumptions. *College Student Journal, 26,* 316-322.

Keeley, S. M., Browne, M. N., & Kreutzer, J. S. (1982). A comparison of freshmen and seniors on general and specific essay tests of critical thinking. *Research in Higher Education, 17,* 139-154.

King, P. M., Wood, P. K., & Mines, R. A. (1990). Critical thinking among college and graduate students. *Review of Higher Education, 13,* 167-185.

Klassen, P. T. (1983). Changes in personal orientation and critical thinking among adults returning to school through weekend college: An alternative evaluation. *Innovative Higher Education, 8,* 55-67.

Lehmann, I. J. (1963). Changes in critical thinking, attitudes, and values from freshmen to senior years. *Journal of Educational Psychology, 54,* 305-315.

Levine, A. & Cureton, J. S. (1998). What we know about today's college students. *On Campus,* 4-9.

Logan, G. H. (1976). Do sociologists teach students to think more critically? *Teaching Sociology, 4,* 29-48.

McMillan, J. H. (1987). Enhancing college students' critical thinking: A review of studies. *Research in Higher Education, 26,* 3-29.

Mines, R. A., King, P. M., Hood, A. B., & Wood, P. K. (1990). Stages of intellectual development and associated critical thinking skills in college students. *Journal of College Student Development, 31,* 538-547.

Norris, S. P. (1985). Synthesis of research on critical thinking. *Educational Leadership, 42,* 40-45.

Nunn, C. E. (1996). Discussion in the college classroom. *Journal of Higher Education, 67,* 243-266.

Pace, C. (1974). *The demise of diversity? A comparative profile of eight types of institutions.* Berkeley, CA: The Carnegie Commission on Higher Education.

Pace, C. (1984). *Measuring the quality of college student experiences.* Los Angeles: University of California, Higher Education Research Institute.

Pascarella, E. T. (1989). The development of critical thinking: Does college make a difference. *Journal of College Student Development, 30,* 19-26.

Pascarella, E. T., & Terenzini, P. T. (1991) *How college affects students.* San Francisco: Jossey-Bass.

Pollio, H. (1984). *What students think about and do in college lecture classes* (Teaching-Learning Issues No. 53). Knoxville, TN: University of Tennessee Learning Research Center.

Spaulding, S. C., & Kleiner, K. (1992). The relationship of college and critical thinking: Are critical thinkers attracted or created by college disciplines. *College Student Journal, 26,* 162-166.

Smith, D. G. (1977). College classroom interactions and critical thinking. *Journal of Educational Psychology, 69,* 180- 190.

Smith, D. G. (1981). Instruction and outcomes in an undergraduate setting. Paper presented at the meeting of the *American Educational Research Association,* Los Angeles.

Smith, D. G. (1983). Instruction and outcomes in an undergraduate setting. In C. L. Ellner & C. P. Barnes (Eds.), *Studies of college teaching* (pp.83-116). Lexington, MA: D.C. Heath.

Terenzini, P. T., Springer, L., Pascarella, E. T., & Nora, A. (1995). Influence affecting the development of students' critical thinking skills. *Research in Higher Education, 36,* 23-39

Terenzini, P. T., Theophilides, C., & Lorang, W. G. (1984). Influences on students' perceptions of their academic skill development during college. *Journal of Higher Education, 55,* 621-636.

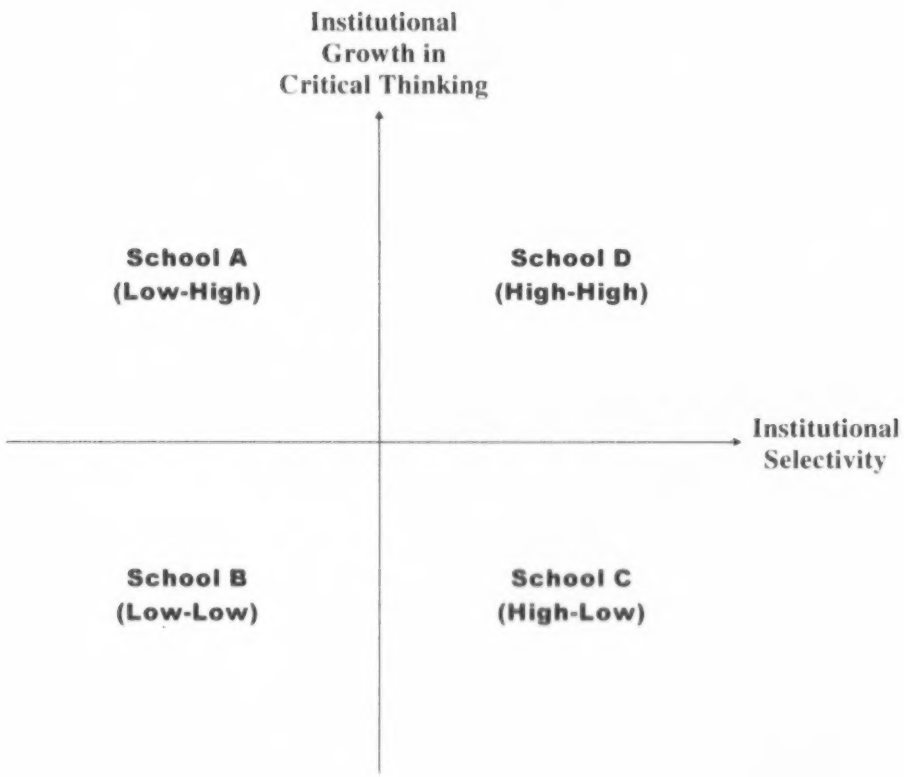
Tsui, L. (1998a). Fostering critical thinking in college students: A mixed-methods study of influences inside and outside of the classroom (Doctoral dissertation, University of California, Los Angeles). *Dissertation Abstracts International, 60*(1):81A.

Tsui, L. (1998b). *A review of research on critical thinking.* Paper presented at the annual meeting of the Association for the Study of Higher Education, Miami, FL.

Tsui, L. (1999). Courses and instruction affecting critical thinking. *Research in Higher Education, 40,* 185-200.

Tsui, L. (in press). Effects of campus culture on students' critical thinking. *Review of Higher Education.*

Winter, D., McClelland, D., & Stewart, A. (1981). *A new case for the liberal arts: Assessing institutional goals and student development.* San Francisco: Jossey-Bass.



Selection Criterion for Case Study Sites

Figure 1[1]

[1] The variable institutional growth in critical thinking appears on the vertical axis, while the variable institutional selectivity appears on the horizontal axis. Because the names of the participating institutions are confidential and will not be revealed, the case study sites will be referred to by an assigned letter.

Table 1. Summary of Classroom Observation Data

	High IGCT Schools		Low IGCT Schools	
	A	D	B	C
Class size	20.3	18.2	13	19.3
Number of questions	15	15.7	13.7	7.6
Percent of questions by students	54	36	47	50
Percent of multiple responses	12	30	14	0
Percent of student responding to students	60	34	3	0
Percent of student participation	64	59	33	29
Number of student challenges	4.3	1.4	0.1	0.5
Number of volunteered comments	6.3	4.7	1.1	0.8
Number of compliments by professor	2.3	0.9	0	0.5

Figures presented in this table are classroom averages for that institution. Descriptions of the above categories are found in Appendix A.

Appendix 1. Descriptions of Categories for the Classroom Observation Data

Category	Description
Class size	The number of students in a class
Number of questions	The total number of questions posed by students and instructor
Percent of questions by students	Percent of total questions that were posed by a student (as opposed to the instructor)
Percent of multiple responses	Percent of total questions that elicited a response from more than one individual
Percent of student responding to students	Percent of questions posed by a student that was met by a response from another student
Percent of student participation	Percent of students present in class who participated in the class discussion
Number of student challenges	Number of statements by a student that expressed dissent or disagreement with what had been said in the class discussion
Number of volunteered comments	Number of comments that were volunteered by a student (this excludes questions posed by students or student responses to a question posed)
Number of compliments by an instructor	Number of compliments by an instructor to a student for his or her contribution to the class discussion